

SECTION 11738 - AUDIO VISUAL SYSTEM

PART 1 - GENERAL

1.1 DEFINITIONS

A. Section Includes - Complete and working audio visual system for the Telemed / Multi-Disc Room 1.2360B, Classroom Learning Room 1.2345A and Conference Rooms 1.2325A, 1.2325B, and 1.2325C in the Ambulatory Clinical Building at the University of Texas M D Anderson Cancer Center in Houston, Texas.

1.2 PERFORMANCE REQUIREMENTS

A. High-quality display of video and RGBHV sources.

B. Simple, intuitive control of major system components.

C. Install system in professional manner using balanced audio lines and separation of conductors carrying different voltage levels to reduce system hum and crosstalk.

D. Proper layout of equipment and cables in Equipment Racks, providing flexible operation, ease of service, and neat appearance.

E. All new equipment to meet or exceed manufacturer's specifications.

F. System to be adjusted for best operation of all components.

G. Related Work Not Included
1. Electrical Work (conduit and electrical power wiring)
2. Millwork

1.3 SUBMITTALS

A. Work Progress Schedule
1. Number of Sets: 4.
2. Guidelines – Estimated progress schedule for Work, in relation to entire Project. Indicate dates for starting and completing various classifications of construction. Include specific dates for each submittal requirement, expected completion of conduit by Electrical Contractor (coordinate), expected completion of electrical power by Electrical Contractor (coordinate), Initial Tests and Adjustments, Final Tests and Adjustments, and Owner Training. Coordinate one 12-hour day of quiet time (during first shift) for Final Tests and Adjustments. Schedule items shall be subdivided such that no single item spans more than 30 calendar days.
3. Timetable – Submit for review within 2 weeks after receipt of contract. Update schedule as Work progresses.

B. Product Data
1. Number of Sets: 6.
2. Guidelines – According to General Conditions, minimum as follows.
Major Equipment Data – Supply individual data sheet for each major manufactured equipment item. Include photographs of appearance, descriptions of finishes, dimensions, and technical data for review by Owner, Architect, and Consultant.
Minor Equipment Data – Multiple-product data sheets for minor items (connectors, hardware, etc.) are acceptable. Clearly designate items submitted with red arrows or red underlines. Cross-out items not submitted.

Bind product data sheets together either in GBC or 3-ring type binders.

3. Timetable
Submit total quantity of complete sets of Product Data as required by General Conditions, no later than 30 days after award of contract. Partial submittals are not acceptable.

Allow minimum of 30 days for review. Two sets will be returned with review comments. If resubmittal is required, resubmit total quantity of complete sets. If second resubmittal is required, Contractor shall reimburse Owner for expenses incurred during additional review process.

Obtain approved Product Data before commencement of work.

C. Shop Drawings

1. Number of Sets: 6.
2. Minimum Scale
 - a. Floor Plans: 1/8 inch = 1 foot
 - b. Rack Elevations: 1-½ inch = 1 foot
 - c. Plate/Panel Details: 6 inches = 1 foot
 - d. Loudspeaker Details: 1 inch = 1 foot
3. Include as a minimum:
 - a. Floor plans indicating locations of devices, vertical risers, pull boxes, and exposed wiring.
 - b. Loudspeaker orientation details.
 - c. Mounting detail drawings of loudspeakers, racks, and overhead equipment. Hire services of professional structural engineer, licensed to practice in the State of Texas, to review shop drawings, building structural drawings, and any existing structures from which equipment is to be suspended. Include Structural Engineer's stamped report with shop drawing submittal. Report to include: (a) itemization of items reviewed by the Structural Engineer, (b) confirmation that proposed methods of suspending equipment as shown on the shop drawings conform to required safety factors, and (c) confirmation that building structure from which equipment is to be suspended will support equipment including required safety factors.

Rack elevations
Complete schematic diagram. One-line diagram with detailed descriptions of product inputs and outputs is acceptable. Include terminal strip details and cable label information. If wiring diagram spans more than 3 sheets, additionally provide simplified block diagram of entire system on 1 sheet.

Electrical power wiring diagram. Include circuit, switching, and control details.

Wiring diagram of grounding and shielding scheme.

Drawings for custom-fabricated items (i.e., plates, panels, cables, and assemblies).

General construction drawings necessary for completion of work.

4. Guidelines
 - a. Shop Drawings to be used for coordination between trades and updated as final record drawings.
 - b. Number and title each drawing in logical manner as a set.
 - c. Include on each drawings: Project, Building, location, Contractor Name, Architect, Acoustical Consultant, date, and revision number.
 - d. Ensure that labeling on Shop Drawings match labeling on equipment.
 - e. Bind Shop Drawings together to form set. Loose drawings will not be accepted.
 - f. Copies of electronic CAD files including Contract Drawings will be made available from Consultant in AutoCAD LT 2000 or LT 2002 format.
5. Timetable
 - a. Submit total quantity of complete sets of Shop Drawings as required by General Conditions, no later than 30 days after award of contract. Partial submittals are not acceptable.
 - b. Allow minimum of 30 days for review. Two sets will be returned with review comments. If resubmittal is required, resubmit total quantity of complete sets. If second resubmittal is required, Contractor shall reimburse Owner for expenses incurred during additional review process.
 - c. Obtain approved Shop Drawings before commencement of work.

D. Samples

1. Request for Samples - Upon request, furnish samples (at no additional cost) of submitted items proposed as substitutes for specified items. Products will be reviewed to determine if proposed substitute items meet required function and quality.
2. Product Tests - Products submitted as samples may require testing by independent laboratory. Testing at expense of Contractor.
3. Number of Samples – 1 for each item requested.
4. Timetable - Provide samples within 2 weeks of request. Allow minimum 2 weeks for review and product tests.
5. Approval - Obtain written approval of tested products before incorporating into system.

E. Proposed Test Equipment – Submit, for approval, a letter listing test equipment make and model numbers and calibration date 10 days prior to scheduling Final Tests and Adjustments.

F. Initial Test Data – Submit results of Initial Tests and Adjustments for approval prior to scheduling Final Tests and Adjustments with Consultant and Owner.

G. Project Record Documents – Submit record documents in quantities, format, and timetable as required by General Conditions.

H. Operation and Maintenance Manuals

1. Number of Sets: 3.
2. Bind Operation and Maintenance Manuals using either GBC or 3-ring type binders.
3. Format and Minimum Information:
 - a. Section 1 - System Operation
 - i. Introduction/overview to system components and their functions and locations; brief listing of basic system functions
 - ii. Complete but simple system operating instructions to accomplish basic system functions, written for non-technical personnel
 - iii. Certificate indicating names of Owner personnel trained by Contractor, date of training, name of Contractor representative that provided training, and name of project.
 - b. Section 2 - System Documentation
 - i. Simplified system one-line schematic diagram showing changes made during construction
 - ii. Complete inventory of system components including serial numbers. Identify location (equipment rack, over stage, stored in control room, etc.) of each component.
 - iii. Cable and terminal strip documentation including cable numbers, functions, originating locations, terminating locations, and signal levels
 - iv. All Shop Drawings corrected to reflect as-built conditions
 - v. Other data and drawings required during construction
 - vi. Initial Tests and Adjustments data
 - vii. Final Tests and Adjustments data
 - viii. Floppy diskettes and CD-ROM discs including all utilized manufacturer's software and saved copies of software configurations (configurations as established during Final Tests and Adjustments)
 - c. Section 3 - Manufacturer's Documentation – Provide following documentation
 - i. For each equipment model at no additional costs to Owner, even if manufacturer does not include costs of such documentation with purchase of equipment item.
 - ii. Manufacturer's Product Data
 - iii. Operating instructions
 - iv. Installation instructions
 - v. Service information
 - vi. Schematic diagrams
 - vii. Replacement parts lists
 - d. Section 4 - Maintenance Information
 - i. Preventive maintenance schedule letter clearly stating target dates of six month and end-of-warranty preventative maintenance inspections

- ii. Maintenance instructions including recommended maintenance schedule and information concerning proper inspection, testing, and replacement of components
 - iii. Troubleshooting information complete with instructions for procedures during equipment failure
- e. Section 5 - Warranty Information
 - i. System warranty letter
 - ii. Manufacturer's warranties
- 4. Provide 3 sets of CD-R that include all material in Operation and Maintenance Manuals in PDF format except for copyrighted manuals.
- 5. Timetable
 - a. Submit 1 set of Operation and Maintenance Manuals at least 10 days before Final Tests and Adjustments procedures (minus data from Final Tests and Adjustments). This set will be reviewed by Acoustical Consultant and returned to Contractor. Re-submit after Final Tests and Adjustments and include data. NOTE: Do not schedule Final Tests and Adjustments or perform training of Owner personnel before submitting Operation and Maintenance Manual.
 - b. Leave 1 set of Operation and Maintenance Manuals with Owner's representative immediately following Final Tests and Adjustments procedures (minus data from Final Tests and Adjustments). Owner will utilize this set during initial use of the system. Following Final Tests and Adjustments, update this set of manuals at the project site as necessary so that it will match other completed sets of manuals.
 - c. Submit remaining number of complete manuals as required by General Conditions within 10 days after return of reviewed set(s). Include Final Tests and Adjustment data, warranty period letter, and any other data not included in first submission.

I. Warranty - Submit letter providing warranty covering labor and materials supplied under this contract. Bind in Operation and Maintenance Manuals. Terms as described in General Conditions. Minimum terms as follows.

- 1. System Warranty Period - Systems to be free of manufacturing or installation defects for a period of one year from the date of final acceptance. Clearly designate begin and end dates of system warranty period.
- 2. Parts and Labor - Provide parts and labor to repair defects in materials and workmanship during system warranty period.
- 3. Response Time - Within system warranty period, provide initial on-site service response within one business day of service call.
- 4. Replacement Products - If any item must be removed for repair during system warranty period, provide replacement item of similar quality at no charge.
- 5. Repair Limit - Do not repair any piece of equipment found defective during installation or system warranty period more than 2 times. After second repair, replace defective item with similar approved item at no additional cost to Owner.
- 6. Extended Manufacturer's Warranties – Identify products with manufacturer's warranties extending beyond one year. Provide terms and conditions of such warranties.
- 7. Service Personnel Information - Provide name(s) and telephone number(s) of service personnel to be contacted regarding repair and maintenance.

J. Owner Training – Provide owner training as described in General Conditions. As a minimum, provide 8 hours total instruction (within two trips to site) regarding Sound Systems operation to Owner-designated personnel. Schedule instruction time(s) with Owner to occur after completion of Final Tests and Adjustments. Coordinate with Owner in advance to schedule instruction time. Document date, time, and attendees of the training session and include documentation in Operation and Maintenance Manuals to serve as record of trained personnel.

1.4 QUALITY ASSURANCE

A. Contractor Qualifications

1. Be established Audio Visual System Contractor, regularly engaged in furnishing and installing audio visual systems.
NOTE: Electrical or general contracting firms responsible for completion of this work, but not meeting above requirement, shall employ services of approved Audio Visual Contractor as subcontractor to perform Work described herein.
2. Be experienced in installations of similar size and scope within last five years. Submit list of 4 (minimum) installed jobs of similar magnitude, completed within last five years. For verification, submit complete information, including project name, project address, contact person, and daytime telephone number. At Owner's request, accompany Owner or Owner's representative on visit to any or all example completed projects submitted.
3. Be Authorized Dealer for major lines of equipment provided. Must have at least one permanent staff member who is factory trained in the installation and maintenance of each major product line offered.
4. Employ personnel (at all levels of work) experienced in projects of similar scope and size. Provide list of key personnel to be responsible for each of the following aspects of work: Project Management, Technical Documentation, and Leadership of Field Work (one who is present for all field work). For each identified employee, indicate number of years employed by contractor, number of years experience in assigned responsibilities, and list of previously completed projects where similar responsibilities were required.
5. Project manager assigned to this project must have a minimum of 5 years experience in installing and integrating audio visual systems. If project manager has less than 5 years experience, project manager then must have a minimum of 3 years experience in installing and integrating audio visual systems and an ICIA-CTS certification.

B. Codes - Execute work in accordance with standard sound and system installation practices, National Electrical Code, and applicable state and local codes.

C. Testing Standards - Perform testing in accordance with ANSI standards. Applicable standards include the following.

1. ANSI S1.4-1983 - Specifications for Sound Level Meters
2. ANSI S1.40-1984 - Specifications for Acoustic Calibrators
3. ANSI S1.11-1986 - Specifications for Octave-Band and Fractional Octave-Band Analog and Digital Filters.
4. ANSI PH7.201-1983 - Method for Measuring Screen Illumination of Front Projection Audio-Visual Equipment.
5. EIA RS-250C - Short haul audio and video transmission standards.

D. Regulations – For spaces other than religious places of worship, comply with terms and conditions of Americans With Disabilities Act, especially regarding provisions for hearing impaired and wheelchair access in control area.

E. Rigging - Use precautions when lifting and attaching equipment overhead. Select mounting or lifting hardware to provide safety factor meeting or exceeding project value (minimum safety factor of 5). Provide attachment hardware rated SAE Grade 5 minimum. Lag screws or formed eye bolts not acceptable. Verify load ratings of hanging components, including attachment details, on Shop Drawings reviewed by Structural Engineer licensed to practice in the State of Texas. Execute attachments, attachment points reinforcements, and hardware selection in accordance with following references.

1. Newberry, W. G., - Handbook for Riggers, 1977 Revised Edition, Calgary, Alberta Canada
"Basic Principles for Suspended Loudspeaker Systems," Technical Notes Volume 1, Number 14, JBL Professional, Northridge, California

1.5 STORAGE AND HANDLING

- A. Damage Prevention - Ensure that materials (especially electronic and electro-acoustic devices) are protected against physical, environmental, and electronic damage during transport to and installation at job site.
- B. Magnetic Materials Handling - Take special precautions with magnetic devices. Keep temperature during storage and delivery below 110 degrees Fahrenheit. Keep devices with magnetic fields (loudspeakers, microphones, etc.) away from magnetic storage media (computers, floppy disks, cassette tapes, etc.), especially in common storage area.
- C. Materials Acceptance - Coordinate with Owner for acceptance of materials and labor at job site.
- D. Storage Location - Coordinate storage location at job site or designated storage area at contractor warehouse.
- E. Storage Protection - Provide storage protection against temperature and humidity extremes, theft, vandalism, physical damage, and environmental damage.

PART 2 - PRODUCTS

2.1 GUIDELINES

- A. Design Parameters - System design is around products listed in Part Two. Intent of product specification is to provide standard of quality and function for installed materials. Certain performance specifications are given to clarify job requirements. No substitutions will be allowed without prior approval specific to proposed manufacturer and model numbers.
- B. Performance - Regardless of completeness of descriptive paragraphs herein, each device shall meet its manufacturer's published specifications. Verify performance.
- C. Quantities - Quantities given in specifications are for reference only; confirm quantities prior to installation. If Contract Documents do not include quantities necessary to deliver complete working system, provide notification of disparity, and install required quantity of devices for complete working system.
- D. Balanced Lines – Unless specifically directed otherwise, wire all line and microphone level circuits as balanced with respect to signal ground. For products without balanced inputs or outputs, provide high quality balancing transformers by Jensen or ProCo with proper level, shielding, and impedance characteristics. Assure all audio levels arriving and leaving matrix and routing switchers are equal to the manufacturer's recommended input audio level for the GE/Fiber Options fiber optic audio/video transmission interface. If required, use RDL amps for level matching.
- E. Small Parts - Systems are described in terms of major products. Even if not specifically mentioned, provide and install patch cables, connectors, hardware, labels, terminals, etc. necessary for complete and working system meeting design intent of specifications. Install shaft locks or security covers on rack-mounted equipment not normally adjusted by user.
- F. Keys - Provide 5 sets of keys for any sound system product requiring keys.
- G. Condition - Provide and install products listed in this section in factory new condition, conforming to applicable provisions of American National Standards Institute.
- H. Designations - Each major product item is given unique designation (such as MIX-1 for mixer number 1). The product designations are unique in this section only and may be repeated in other specification

sections. Equipment provided by others and installed by others designated as (OFOI). Equipment provided by others and installed by AV Contractor designated as (OFCI).

2.2 AV RACK PRODUCTS – ROOM 1.2340 REAR PROJECTION / TV CONTROL

- A. AV Rack Electrical Power - Coordinate with Electrical Contractor regarding proper placement of isolated-ground duplex outlets on walls of the AV Booth Area. Electrical circuits should be connected (and outlets wired) by the Electrical Contractor to the AV system circuit breaker panel (N.I.C.). Ensure that "Star" ground configuration is properly implemented by the Electrical Contractor. Ensure that ground wires from each outlet are isolated from conduit, neutrals, and each other, and are each "home-run" back to the dedicated breaker panel for AV systems.
- B. Equipment Rack (RK-3 and RK-4) – Middle Atlantic WRK-40-27 equipment SPN-40-267 side panels, MW-ST top and CBS-WRK-27 caster base (quantity: 2). Provide new, and install as shown in drawings. Provide and install new blank and vent panels to match equipment rack. Fill rack spaces reserved for future equipment with blank panels. Provide shelf for mounting of any device for which rack mount kit is not available.
- C. Pull-Out Rack Shelf – Middle Atlantic SS heavy-duty sliding shelf (quantity: 1) capable of latching at the "out" or "in" positions. Provide new, and install in AV Rack as shown in drawings for use with setup and maintenance equipment
- D. RGBHV / Stereo Audio Matrix Switcher (VSW-2) – Extron Crosspoint Plus 3232HVA (quantity: 1) 32x32 RGBHV, composite video and stereo audio matrix switcher with RS232 control capabilities. Switcher to have a minimum bandwidth of 425 MHz. (-3dB) fully loaded. Install with in AV Racks and integrate into system as shown in drawings.
- E. S-VHS VCR (VCR-1) —JVC SR-V10U S-VHS VCR (quantity 1). Provide with rack mount kit. Install in AV Rack and integrate into system as shown in drawings.
- F. (Intentionally Left Blank)
- G. (Intentionally Left Blank)
- H. Control System Mainframe (CSM-1) – AMX NXF Cardframe with NetLinx NXC-ME260 master processor card (quantity: 1) and PSN6.5 power supply (quantity: 2). Provide with control cards as necessary to interface to devices identified on drawings. Also provide control for projection screen and Lutron house lighting system. Provide power sensors for any equipment without true 2-way RS-232. Owner and AV Contractor to coordinate all touch panel layouts . AV Contractor to provide all source code. AV Contractor to provide to Owner all files, program blocks and other related files used to develop control program. AV Contractor to provide final loaded control program on 3½-inch floppy disk and printed format. Also program two existing touch panels to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions as directed by Owner. Include screen layout and menu branching drawings in submittals. AMX to provide all software programming, including 4 days onsite. Refer to AMX Master Quote #M40031. Owner to provide a copy of standard Touch Panel pages for reference. AV Contractor to provide all source code. AV Contractor to provide web-control using AMX NetLinx controller internal web interface. Provide web-control for each Touch Panel in AV system. Include page tracking between Touch Panel and web-control panel. Also include in submittals a detailed one-line diagram of control system network configuration showing all interface boxes, power supplies, Ethernet hubs etc. Provide additional AMX PSN6.5 power supply to power field interface boxes via AXLINK such as Extron IPL series such as Extron IPL series. Provide new and install with rack mount kit in AV Racks and integrate into system as shown in drawings. Control system to include the following functions:

Each video camera to have a minimum of 16 presets programmed. 3-chip video camera at front of room on side of rear projection screen (CAM-1) to have 30 presets programmed (two persons for each of 30 participant microphone positions.) Typical operation mode will be participant microphone positions will launch presets via activation of audience microphone (M). Sense from these microphones to be wired to AMX IO cards to activate preset, and verify active microphones via Gentner XAP system. Manual mode to be activated via password-protected technical touch panel page.

- I. Floating Control System Touch Panel (CP-2) – AMX Modero NXT-CV12 (quantity: 1) 12-inch (diagonal) color video, active matrix TFT monitor with 1024 x 768 native resolution. Panel to have composite NTSC and audio input via CAT5 interface. Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Provide new, install in AV rack, and integrate into system as shown in drawings. Install new and integrate into system as shown in drawings
- J. Teleconference Mixer/Router (TMR-1) – ClearOne/Gentner XAP-800 teleconference mixer (quantity: 5) with echo cancellation for each microphone input, 12 x 12 router and digital signal processing including limiters and equalizers for each input and output. Unit to controllable via RS-232. Provide new, install in AV rack, and integrate into system as shown in drawings.
- K. Telephone Interface (THI-1) – ClearOne/Gentner XAP-THI-1 teleconference interface (quantity: 1) Unit to have integrated telephone interface. Unit to controllable via RS-232. Provide new, install in AV rack, and integrate into system as shown in drawings.
- L. Wireless Microphone System –Shure U124M/BETA58 (quantity: 1) combination body pack and handheld system including two receivers (designated in drawings as WM-1 and WM-2), one bodypack transmitters, one omnidirectional lavalier and one BETA58 handheld microphone/transmitter microphones. Provide all new. Install receiver in AV Racks as shown in drawings. Coordinate frequency selection with other radio-frequency sources in the area and with manufacturer's recommendations. Deliver transmitter, microphone, accessories, and unused batteries (for transmitters) to Owner following Final Tests and Adjustments. Provide additional batteries for using during tests and adjustments. Initially install provided antennas at rear of receiver (enclosed inside AV Rack; i.e., the most secure location for antennas). Test performance of wireless systems while transmitters are walked around all of the Classroom. If reliable performance (without dropout or interference) cannot be obtained with antennas mounted inside rack, then relocate antennas to positions outside of rack. Propose new locations to Owner or Consultant, relocate antennas with necessary cabling, and retest. Relocate a second time if necessary.
- M. Audio Amplifier (PA-1, PA-2 and PA-3) – QSC CX-1102 amplifier (quantity: 3). Provide new, install in AV rack, and integrate into system as shown in drawings.
- N. (Intentionally Left Blank)
- O. Scan Converter (SCV-1 & SCV-2) Extron VSC 500 scan converter (quantity: 2). Provide new, install in AV rack, and integrate into system as shown in drawings.
- P. (Intentionally Left Blank)
- Q. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
 - Composite Video Plenum Rated Cable: West Penn 25806
 - RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
 - Control Plenum Rated Cable: West Penn D25350

Control CAT5E Plenum Rated Cable: West Penn 254245
Loudspeaker plenum cable: West Penn 25226

- R. Fiber Transceiver (FBR-1 and FBR-2) Fiber Options/GE Model B768AV-T-RST1 (quantity: 2) and Fiber Options/GE Model B768AV-R-RST1 (quantity:2). Provide new, install in AV rack, and integrate into system as shown in drawings.
- S. Video /Audio DA (VDA-2) Extron AVDA 6 MX one composite video with stereo balanced audio input and six composite video with stereo balanced audio outputs distribution amplifier (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- T. Video /Audio DA (VDA-7) Extron MDA 3AV one composite video with stereo balanced audio input and three composite video with stereo balanced audio outputs distribution amplifier (quantity: 6). Provide new, install in AV rack, and integrate into system as shown in drawings.
- U. Control System Ethernet Switch (CSS-1) Cisco Catalyst 2940-8TT fast Ethernet switch (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- V. Genlock Generator (GLG-1) – Hortia BG-50 blackburst generator (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- W. RF Demodulator (DMD-1) – Blonder Tongue AD-1 demodulator with Option 20 RS-232 serial control (quantity: 3). Provide new, install in AV rack, and integrate into system as shown in drawings.
- X. Listen Assist Transmitter (LAT-1) – Listen Technologies LS-02-072 system (quantity: 1). Also provide Listen Technologies LA-361 high capacity alkaline batteries (quantity: 24). Provide new, install in AV rack, and integrate into system as shown in drawings.
- Y. Control Audio Video Breakout Box (AVI-1) – AMX NXA-AVB Modero touch panel AV to CAT5 breakout box (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- Z. Rack Panel (ARP-1)– Custom one unit rack panel with connectors as shown in drawings (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.

2.3 PROJECTION PRODUCTS - ROOM 1.2340 REAR PROJECTION / TV CONTROL

- A. Video / Data Projector Lens (VPL-1) – Provide lens for Sharp XG-V10XU (OFCI) projector. Provide Sharp AN-LV36EZ 1.7 to 2.7:1 zoom lens (quantity: 2) for left and right video projectors. Provide new, mount projector (By Others) and lens on custom mirror system MIR-1, and adjust for optimum projected image quality and integrate into system as shown in drawings.
- B. (Intentionally Left Blank)
- C. Projector Support and Mirror System (MIR-1)– Draper mirror system / data projector stand (quantity: 1). See Draper quote H0040305-1. Hudson Mirrorlite PFS first-surface, optical quality mirrors (quantity: 6) with 86% reflectance on Draper stand. Mount mirrors onto metal back frame to maintain plane flatness and mount back frame to metal support frame to provide vertical tilt adjustment of mirror surfaces. Provide mountable support for 3 data video projectors each with forward/back and tilt adjustment capabilities. Integrate multiple mirrors, each tilt-adjustable and lockable, for 4:3 aspect ratio data images on left and right halves of rear projection screen, 16:9 or 4:3 aspect ratio data image centered on rear projection screen, and 3:2 aspect ratio 35mm slide images on center and left and right halves of rear projection screen. Paint all frame components flat black and mount on floor. Provide new and adjust precise locations and mirror angles to achieve projected image display linearity of all images.

D. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.

- Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
- Composite Video Plenum Rated Cable: West Penn 25806
- RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
- Control Plenum Rated Cable: West Penn D25350
- Control CAT5E Plenum Rated Cable: West Penn 254245
- Loudspeaker plenum cable: West Penn 25226

2.4 FIELD PRODUCTS – CLASSROOM LEARNING 1.2345

- A. Floor Boxes (FB-3, FB-4, FB-6) – Three FSR FL-640P-B-6 floor pocket assemblies *provided and installed by Electrical Contractor*. Electrical Contractor will also provide and install one electrical power outlet within each of these Floor Pockets. Provide custom insert plates for each Floor Pocket (quantity: 2 plate each in Floor Pocket, 6 total plates) with low-voltage connectors and engraving as shown in drawings. Provide all low-voltage wiring, and install insert plates as shown in drawings.
- B. (Intentionally Left Blank)
- C. (Intentionally Left Blank)
- D. (Intentionally Left Blank)
- E. Front Projection Screen (SC-3) (OFOI) Draper Rollaramic 16' x 9' electric projection screen with matte white surface with 3' extra drop at top with low voltage control (By Others) (quantity: 1. Integrate into control system as shown in drawings.
- F. Rear Projection Screen (OFOI) – Draper Cine10NG 16"0" x 6"0" rear projection screen with system 300 frame with coated side facing the audience.
- G. (Intentionally Left Blank)
- H. Video Camera and Pan/Tilt Unit (CAM-3) - Sony DXC-990 video camera with Canon YH19x6.7 KTS 19x zoom lens, with AMX AXB-PT15 pan/tilt assembly with servo camera power option (quantity: 2). Mount video camera and pan tilt to vertical surface in rear cove with Peerless CS9W mount (quantity: 2). Dress all cables neatly from interface plate to camera assemblies. Also provide Sony CMA-D2 camera power supply (quantity: 2), Sony CCMC-02 cable (quantity: 2), and AMX CC-CAM lens control cable (quantity: 2), and CC-CAM RS-232 control cable (quantity: 2). Provide Dataprobe iboot Ethernet controllable power switch (EPS-1) (quantity: 1). Provide new and integrate into system as shown in drawings.
- I. Remote Video Camera, Lens, and Pan/Tilt Unit (CAM-4) – Sony DXC-990 video camera with Canon YH19x6.7 KTS 19x zoom lens, with AMX AXB-PT15 pan/tilt assembly with servo camera power option (quantity: 1). Also provide Sony CMA-D2 camera power supply (quantity: 1), Sony CCMC-02 cable (quantity: 1), and AMX CC-CAM lens control cable (quantity: 1), and CC-CAM RS-232 control cable (quantity: 1). Mount PTZ assembly to wall with AMX WM-CAM mount (quantity: 1). Provide Dataprobe iboot Ethernet controllable power switch (quantity: 1). Provide new and integrate into system as shown in drawings.
- J. Loudspeakers (LS-1, LS-2, LS-3, LS-4, LS-5 and LS-6) – Renkus Heinz TRX121/9 full-range loudspeakers (quantity: 6), each with screw terminal input connections, and appropriate mounting hardware. Include necessary rigging and hanging hardware to suspend loudspeakers (from planned building structure) at locations as shown in drawings. As necessary, coordinate and install hanging hardware from available structure well before completion of ceiling. Mount according to table below. Indicate hanging and rigging details in shop drawings. Mount loudspeakers above finished ceiling plane

a maximum of 3-inches from the finished ceiling plane. All loudspeaker hardware to be new. Coordinate exact location of loudspeaker conduit prior to conduit installation to minimize exposed cable and rework above ceiling. Paint metal grill, enclosure, mounting hardware, and exposed cabling as necessary to minimize visibility. Remove or paint all logos. Provide new and integrate into system as shown in drawings.

LOUDSPEAKER	VERTICAL ANGLE (DEGREES)	HORIZONTAL ANGLE (DEGREES)	ROTATION (DEGREES)
LS-1	-57	62	0
LS-2	-61	0	0
LS-3	-57	-62	0
LS-4	-28	58	0
LS-5	-44	0	0
LS-6	-28	-58	0

- K. Wall Mounted Control System Touch Panel (WCP-1) – AMX AXD-CP4/A 4-inch color passive touch panel with 6 fixed external backlit illuminated pushbuttons (quantity: 2). Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Locate at wall plate WP-C. Provide new and integrate into system as shown in drawings.
- L. Audience Microphone (M) – Crown PCC-170SW hardwired boundary microphone with programmable membrane switch (quantity: 30). Provide separate logic sense cabling from each microphone to control system. Microphone cables to be routed through legs in audience tables. Install new where shown on drawings.
- M. Plasma Feedback Monitor (MPM-1) – Zenith P50W38 50-inch plasma display (quantity: 1) for use as a feedback monitor. Provide Extron SY-VGAM-RGBHVM 6-foot VGA to RGBHV BNC cable (quantity: 1), and Extron RG6/SHR-1 BNC to BNC 6-foot cable (quantity: 1) with unit. Mount on Draper Aero Mobile 1450 stand and field cut extruded aluminum column to place top of plasma display at 36-inches AFF and bottom of plasma display at approximately 7-inches AFF. Mount Extron IPL-T-S2 Ethernet to serial control interface to optional stand base shelf. Provide new and integrate into system as shown in drawings.
- N. Connectors – Connectors to be of the quantity and type as required for proper and durable operation and signal transmission of the electrical characteristics for associated circuitry. Microphone connectors: 3-conductor XLR type. Control panels: XLR type with number of conductors as required. Line level and left/right audio connectors: tip/ring/sleeve 1/4" phone jacks with insulated bushings. Composite video and RGBS connectors: BNC dual crimp 75 ohm Canare or accepted substitution. S-video: standard 4-pin S-video mini-din.
- O. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.

Composite Video Plenum Rated Cable: West Penn 25806
RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350
Control CAT5E Plenum Rated Cable: West Penn 254245.
Loudspeaker plenum cable: West Penn 25226

- P. Web Video Camera (CAM-2) - Axis 2100 1-chip analog CCD web camera with auto focus (quantity: 1). Provide grommet at interface plate. Install new, at wall with Pelco CM175 wall mount, where shown on drawings.
- Q. AXLINK Modero Power Break-out Cable (AMBC-1) – Four foot long 4-pin XLR to Provide new, as shown on drawings.

2.5 FIELD PRODUCTS – IN REAR ALCOVE OF CLASSROOM LEARNING 1.2345A

- A. Equipment Cabinet/Desktop (ECD-1) - HSA Model RTCUS Rolltop Custom lockable desk / two 10RU equipment rack cabinet s with heavy-duty castered base (quantity: 1) Wood finish to be stained to match Classroom Learning 1.2345 millwork. Provide new, and integrate into system as shown in drawings.
- B. (Intentionally Left Blank)
- C. Pan/Tilt Video Camera Control –AMX AXP-PLV Positrak Camera Control (quantity: 1). Unit to provide pan/tilt/zoom/focus control and iris control option. Provide new, and integrate into system as shown in drawings.
- D. Touch Panel Control Monitor - AMX Modero NXT-CV15 (quantity: 1) 15-inch (diagonal) color, video table top control panel. Panel to have composite video and audio input via CAT5 interface. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. AMX to provide all software programming, including 4 days onsite. Refer to AMX Master Quote #M40031. Owner to provide a copy of standard Touch Panel pages for reference. AV Contractor to provide all source code. AV Contractor to provide web-control using AMX NetLinx controller internal web interface. Provide web-control for each Touch Panel in AV system. Include page tracking between Touch Panel and web-control panel. Include in submittals a detailed one-line diagram of control system network configuration showing all interface boxes, power supplies, Ethernet hubs etc. Provide new and install with rack mount kit in AV Racks and integrate into system as shown in drawings.
- E. S-VHS VCR (VCR-1) –JVC SR-V10U S-VHS VCR (quantity: 1). Provide with rack mount kit. Provide interconnect cables to RIOP-1. Install in Equipment Cabinet/Desktop and integrate into system as shown in drawings.
- F. Lockable Rack Drawer (DRAW-1) – Middle Atlantic TD3-FLK three rack unit lockable drawer (quantity: 4).. Install in Equipment Cabinet/Desktop and integrate into system as shown in drawings
- G. Audio Monitor (AMON-1)– Wholer AMP-1 rack mounted powered audio monitor (quantity: 1). Provide interconnect cables to RIOP-1. Install in Equipment Cabinet/Desktop and integrate into system as shown in drawings.
- H. Preview Monitor (VMON-1) – Marshall V-R44P four pack 4-inch video rack mount monitor (quantity: 1).. Provide interconnect cables to RIOP-1. Install in Equipment Cabinet/Desktop and integrate into system as shown in drawings

- I. Program Monitor (VMON-2) – Marshall V-R70P 7-inch video rack mount monitor (quantity: 1). . Provide interconnect cables to RIOP-1. Install with Leader cradle in Equipment Cabinet/Desktop and integrate into system as shown in drawings.
- J. Floating Computer Interface - Extron RGB 201 Rx Universal Interface with VGA/stereo audio and MAC/stereo audio cables (quantity: 1). Provide new.
- K. Push –to-Talk Microphone (PTT-1) – Shure 450 Series II push-to-talk desk mount microphone. Terminate with balanced XLR connector. . Provide interconnect cables to RIOP-1. Provide new.
- L. Rack Input /Output Panel (RIOP-1) – Bud Industries 1375 rack mountable interface plate (quantity: 1). Provide Install in Equipment Cabinet/Desktop and integrate into system as shown in drawings.
- M. Connectors – Connectors to be of the quantity and type as required for proper and durable operation and signal transmission of the electrical characteristics for associated circuitry. Microphone connectors: 3-conductor XLR type. Control panels: XLR type with number of conductors as required. Line level and left/right audio connectors: tip/ring/sleeve 1/4" phone jacks with insulated bushings. Composite video and RGBS connectors: BNC dual crimp 75 ohm Canare or accepted substitution. S-video: standard 4-pin S-video mini-din.
- N. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
 - Composite Video Plenum Rated Cable: West Penn 25806
 - RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
 - Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350
 - Control CAT5E Plenum Rated Cable: West Penn 254245
 - Loudspeaker plenum cable: West Penn 25226

2.6 FIELD PRODUCTS – MULTI-MEDIA LECTERN CLASSROOM LEARNING 1.2345

- A. Multi-media Lectern (ML-1) – Multi-media lectern (quantity: 1). Van San Custom #3 Multimedia lectern with clock, light, equipment rack and locking document camera drawer. Finish to wood, stained to match millwork in Classroom Learning 1.2345. Provide new and integrate into system as shown in drawings. Mount equipment identified below into lectern. Reference Van San Quote # 3302.
- B. S-VHS VCR (VCR-1) – JVC SR-V10U S-VHS VCR. Provide with rack mount kit. Install new in Lectern and integrate into system as shown in drawings.
- C. Document Camera (DOC-1) – Elmo HV-7000SX SXGA document camera with composite, and RGBHV outputs with AMX AXB-232++ RS-232 control interface (quantity: 1). Unit to be controllable via RS-232. Provide new, and integrate into system as shown in drawings.
- D. VGA Switcher (VSW-11) – Extron SW4VGAr four-input, one output VGA/balanced stereo audio switcher with RS-232 control. Provide new with rack kit, and integrate into system as shown in drawings.
- E. Lectern Gooseneck Microphone (LGM-1) – AKG GN50 20-inch gooseneck and AKG CK31 cardioid capsule (quantity: 2). Provide new, and integrate into system as shown in drawings.
- F. Touch Panel Control Monitor (CTLP-1)- AMX NXD-CV7 Modero 7-inch color video touch control panel (quantity: 1). Panel to have composite NTSC video inputs. Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source

and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Provide new, install in AV rack, and integrate into system as shown in drawings. Install new and integrate into system as shown in drawings.

- G. Connectors – Connectors to be of the quantity and type as required for proper and durable operation and signal transmission of the electrical characteristics for associated circuitry. Microphone connectors: 3-conductor XLR type. Control panels: XLR type with number of conductors as required. Line level and left/right audio connectors: tip/ring/sleeve 1/4" phone jacks with insulated bushings. Composite video and RGBS connectors: BNC dual crimp 75 ohm Canare or accepted substitution. S-video: standard 4-pin S-video mini-din.
- H. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
 - Composite Video Plenum Rated Cable: West Penn 25806
 - RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
 - Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350
 - Control CAT5E Plenum Rated Cable: West Penn 254245
 - Loudspeaker plenum cable: West Penn 25226
- I. Multi-Media Lectern Video Switcher (VSW-10) – Extron MAV44AV (quantity: 1) four input, four output composite video with balanced stereo audio matrix switcher. Provide new, and integrate into system as shown in drawings.
- J. Multi-Media Lectern EtherNet Switch – Cisco Catalyst 2940-8TT fast Ethernet switch. Provide new, and integrate into system as shown in drawings.
- K. Multi-Media Lectern Integrated Control System (LIC-1) – AMX NI-2000 integrated control system. (quantity: 1). AMX to provide all software programming. Refer to AMX Master Quote #M40031. Owner to provide a copy of standard Touch Panel pages for reference. AV Contractor to provide all source code. AV Contractor to provide web-control using AMX NetLinx controller internal web interface. Provide web-control for each Touch Panel in AV system. Include page tracking between Touch Panel and web-control panel. Also include in submittals a detailed one-line diagram of control system network configuration showing all interface boxes, power supplies, Ethernet hubs etc. Provide new and install with rack mount kit in Lectern racks and integrate into system as shown in drawings.
- L. Multi-Media Lectern Cable Cubby (LCC-1) – Extron 300 Series Cable Cubby (quantity: 1) with cables/connectors as shown in drawings. Provide new, install in lectern rack and integrate into system as shown in drawings.
- M. Multi-Media Lectern Rack Drawer (DRAW-L1) – Middle Atlantic TD2-FLK two rack unit lockable drawer (quantity: 1). Provide new, install in lectern rack and integrate into system as shown in drawings.
- N. AMX Control Power Breakout Cable- Provide six foot power breakout cable with 4-pin XLR to mini phoenix connector (quantity: 2). Provide new.

2.7 AV RACK PRODUCTS – TELEMED / MULTI DISC ROOM 1.2360B

- A. AV Rack Electrical Power - Coordinate with Electrical Contractor regarding proper placement of isolated-ground duplex outlets on walls of the AV Booth Area. Electrical circuits should be connected (and outlets wired) by the Electrical Contractor to the AV system circuit breaker panel (N.I.C.). Ensure that "Star" ground configuration is properly implemented by the Electrical Contractor. Ensure that ground

wires from each outlet are isolated from conduit, neutrals, and each other, and are each "home-run" back to the dedicated breaker panel for AV systems.

- B. Equipment Rack (RK-1 & RK-2) – Middle Atlantic model 5-14 with 14 rack units (quantity: 2) 19" wide x 20" deep metal equipment rack with model 5WL locking casters. Racks to be positioned inside millwork with wiring slack as necessary to allow rack movement outside millwork for service. Provide new, and install as shown in drawings. Provide a shelf for any device for which rack mount kit is not available. Provide and install new blank and vent panels to match equipment rack.
- C. RGBHV / Stereo Audio Matrix Switcher (VSW-4) – Extron Crosspoint 168 HVA (quantity: 1) 16x8 RGBHV, composite video and stereo audio matrix switcher with RS232 control capabilities. Switcher to have a minimum bandwidth of 200 MHz. (-3dB) fully loaded. Install with in AV Rack RK-8 and integrate into system as shown in drawings.
- D. S-VHS VCR (VCR-1) - JVC SR-V10U S-VHS VCR. Provide with rack mount kit. Install in AV Rack, and integrate into system as shown in drawings.
- E. (Intentionally Left Blank)
- F. Scan Converter (SCV-1) Extron VSC 500 scan converter (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- G. (Intentionally Left Blank)
- H. (Intentionally Left Blank)
- I. Integrated Control System (CSM-3) – AMX NI-4000 integrated controller with additional RS-232 card (quantity: 1) and PSN6.5 power supply (quantity: 1). Provide additional AMX PSN6.5 power supply to power field interface boxes via AXLINK such as Extron IPL series. Also provide control for Lutron house lighting system. Provide power sensors for any equipment without true 2-way RS-232. Owner and AV Contractor to coordinate all touch panel layouts . AV Contractor to provide all source code. AV Contractor to provide to Owner all files, program blocks and other related files used to develop control program. AV Contractor to provide final loaded control program on CD-R disk and printed format. Include screen layout and menu branching drawings in submittals. AMX to provide all software programming, including onsite. Refer to AMX Master Quote #M40031. Owner to provide a copy of standard Touch Panel pages for reference. AV Contractor to provide all source code. AV Contractor to provide web-control using AMX NetLinx controller internal web interface. Provide web-control for each Touch Panel in AV system. Include page tracking between Touch Panel and web-control panel. Also include in submittals a detailed one-line diagram of control system network configuration showing all interface boxes, power supplies, Ethernet hubs etc. Provide new and install with rack mount kit in AV Racks and integrate into system as shown in drawings.

Control system to include the following functions:

Each 3-chip video camera at front of room on side of plasma screen (CAM-1) to have a minimum of 16 presets programmed, including preset shots of 6 participant microphone positions. Typical operation mode will be participant microphone positions will launch presets via activation of audience microphone (M). Sense from these microphones to be wired to AMX IO cards to activate preset, and verify active microphones via Gentner XAP system. Manual mode to be activated via password-protected technical touch panel page.

- J. (Intentionally Left Blank)
- K. (Intentionally Left Blank)

- L. Teleconference Mixer/Router (TMR-1) – ClearOne/Gentner XAP-800 teleconference mixer (quantity: 1) with echo cancellation for each microphone input, 12 x 12 router and digital signal processing including limiters and equalizers for each input and output. Unit to be controllable via RS-232. Provide new, install in AV rack, and integrate into system as shown in drawings.
- M. Wireless Microphone System – Shure U14D/50-UB dual-channel body pack system including two receivers (designated in drawings as WM-3 and WM-4), two bodypack transmitters, and two omnidirectional lavalier microphones. Provide all new. Install receiver in AV Racks as shown in drawings. Coordinate frequency selection with other radio-frequency sources in the area and with manufacturer's recommendations. Deliver transmitter, microphone, accessories, and unused batteries (for transmitters) to Owner following Final Tests and Adjustments. Provide additional batteries for using during tests and adjustments. Initially install provided antennas at rear of receiver (enclosed inside AV Rack; i.e., the most secure location for antennas). Test performance of wireless systems while transmitters are walked around all of the room. If reliable performance (without dropout or interference) cannot be obtained with antennas mounted inside rack, then relocate antennas to positions outside of rack. Propose new locations to Owner or Consultant, relocate antennas with necessary cabling, and retest. Relocate a second time if necessary.
- N. Audio Amplifier (AMP-2) – QSC CX-302 amplifier (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- O. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
 - Composite Video Plenum Rated Cable: West Penn 25806
 - RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
 - Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350
 - Control CAT5E Plenum Rated Cable: West Penn 254245.
 - Loudspeaker plenum cable: West Penn 25226
- P. Control System Ethernet Switch (CSS-1) Cisco Catalyst 2940-8TT fast Ethernet switch (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- Q. Composite Video DA (VDA-8) Extron MDA 3V one composite video and three composite video outputs distribution amplifier (quantity: 2). Provide new, install in AV rack, and integrate into system as shown in drawings.
- R. AMX Control AV Patch Panel (CVP-1) - Single rack panel with AMX NXA-AVB (AVI-1) breakout box. (quantity: 1) mounted on side of rack. Provide six foot power breakout cable with 4-pin XLR to mini phoenix connector (quantity: 2). Provide new, install in AV rack, and integrate into system as shown in drawings.
- S. Teleconference Mixer/Router/Interface (TMR-2) – ClearOne/Gentner XPA-400 teleconference mixer (quantity: 1) with echo cancellation for each microphone input, 12 x 12 router and digital signal processing including limiters and equalizers for each input and output. Unit to have integrated telephone interface. Unit to be controllable via RS-232. Provide new, install in AV rack, and integrate into system as shown in drawings.
- T. Genlock Video DA (VDA-6) Extron CVDA MX one composite video and six composite video outputs distribution amplifier (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.

2.8 FIELD PRODUCTS – TELEMED / MULTI DISC ROOM 1.2360B

- A. Floor Boxes (FB-1 and FB-2) – Two FSR FL-640P-B-6 floor pocket assemblies *provided and installed by Electrical Contractor*. Electrical Contractor will also provide and install one electrical power outlet within each of these Floor Pockets. Provide custom insert plates for each Floor Pocket (quantity: 2 plate each in Floor Pocket, 4 total plates) with low-voltage connectors and engraving as shown in drawings. Provide all low-voltage wiring, and install insert plates as shown in drawings.
- B. Audience Microphone (M) – Crown PCC-170SW boundary microphone with programmable membrane switch and XLR connector (quantity: 6). Provide separate logic sense cabling from each microphone to control system. Install new where shown on drawings.
- C. Remote Video Camera, Lens, and Pan/Tilt Unit (CAM-1) – Sony DXC-990 video camera with Canon YH12x4.8KTS 12x zoom lens, AMX AXB-PT15 Positrak 15 Pan/Tilt/Controller (quantity: 2) and AMX PSN6.5 Pan/Tilt 12-volt power supply (quantity: 2). Also provide Sony CMA-D2 camera power supply (quantity: 2), Sony CCMC-02 cable (quantity: 2), and AMX CC-CAM lens control cable (quantity: 4), and CC-CAM RS-232 control cable (quantity: 2). Provide Dataprobe iboot Ethernet controllable power switch (EPS-1) (quantity: 1). Provide new and integrate into system as shown in drawings.
- D. Web Camera (CAM-2) - Axis 2100 1-chip analog CCD web camera with auto focus (quantity: 1). Install new, at wall with Pelco CM175 wall mount, where shown on drawings. (quantity: 1).
- E. Loudspeaker (S2) – JBL Control 25 AV shielded 5 1/4 inch two-way vented loudspeaker with 8 ohm input with wall mount (quantity: as shown on drawings). Install and integrate into system as shown in drawings.
- F. Plasma Display (PDP-1) – Zenith P60W38 60-inch plasma display with 1280 x 720p resolution. Unit to be mounted to Zenith wall mount. Install new where shown on drawings.
- G. Touch Panel Control Monitor - AMX Modero NXT-CV15 (quantity: 1) 15-inch (diagonal) color. Monitor to have composite NTSC inputs. Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Provide new, install in AV rack, and integrate into system as shown in drawings. Install new and integrate into system as shown in drawings
- H. Wall Mounted Control System Touch Panel (WCP-1) – AMX AXD-CP4/A 4-inch color passive touch panel with 6 fixed external backlit illuminated pushbuttons (quantity: 1). Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Locate at wall plate WP-C. Provide new and integrate into system as shown in drawings.
- I. Mobile Document Camera (DOC-1) – Elmo HV-7000SX SXGA document camera with composite, and RGBHV outputs with AMX AXB-232++ RS-232 control interface (quantity: 1). Unit to be controllable via RS-232. Provide new, and integrate into system as shown in drawings. .
- J. (Intentionally Left Blank)
- K. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
 - Composite Video Plenum Rated Cable: West Penn 25806
 - RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
 - Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350

Control CAT5E Plenum Rated Cable: West Penn 254245
Loudspeaker plenum cable: West Penn 25226

L. LCD Display (LCD-1) – Sony LMD-230WS 23-inch wide screen (16:9 ratio) LCD monitor with multi-format interface and SMF-600 extension cable (quantity: 1). Monitor to have 1280x768 dot resolution. Multi-format interface with composite video, component video and computer VGA inputs with optional SDI and DVI input modules. Interface to be mounted in equipment rack. Provide new, and integrate into system as shown in drawings.

2.9 AV RACK PRODUCTS – CONFERENCE ROOMS - SOUND EQUIPMENT ROOM

A. AV Rack Electrical Power - Coordinate with Electrical Contractor regarding proper placement of isolated-ground duplex outlets on walls of the AV Booth Area. Electrical circuits should be connected (and outlets wired) by the Electrical Contractor to the AV system circuit breaker panel (N.I.C.). Ensure that "Star" ground configuration is properly implemented by the Electrical Contractor. Ensure that ground wires from each outlet are isolated from conduit, neutrals, and each other, and are each "home-run" back to the dedicated breaker panel for AV systems.

B. Equipment Rack (RK-5, RK-6) – Middle Atlantic WRK-40-27 equipment rack with SPN-40-267 side panels, MW-ST top and CBS-WRK-27 caster base (quantity: 2). Provide new, and install as shown in drawings. Provide and install new blank and vent panels to match equipment rack. Fill rack spaces reserved for future equipment with blank panels. Provide a shelf for any device for which rack mount kit is not available.

C. RGBHV / Stereo Audio Matrix Switcher (VSW-6) – Extron Crosspoint 128 HVA (quantity 1) 12x8 RGBHV, composite video and stereo audio matrix switcher with RS232 control capabilities. Switcher to have a minimum bandwidth of 200 MHz. (-3dB) fully loaded. Install with in AV Rack RK-8 and integrate into system as shown in drawings.

D. (Intentionally Left Blank)

E. (Intentionally Left Blank)

F. (Intentionally Left Blank)

G. Control System Integrated Controller (CSM-2) – AMX NI-4000 integrated controller (quantity: 1) and PSN6.5 power supply (quantity: 1). Provide with control cards as necessary to interface to devices identified on drawings. Also provide control for projection screen and Lutron house lighting system. Provide power sensors for any equipment without true 2-way RS-232. Owner and AV Contractor to coordinate all touch panel layouts . AV Contractor to provide all source code. AV Contractor to provide to Owner all files, program blocks and other related files used to develop control program. AV Contractor to provide final loaded control program on CD-R disk (3, copies) and printed format. Program touch panels to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions as directed by Owner. Include screen layout and menu branching drawings in submittals. AMX to provide all software programming, including onsite. Refer to AMX Master Quote #M40031. Owner to provide a copy of standard Touch Panel pages for reference. AV Contractor to provide all source code. AV Contractor to provide web-control using AMX NetLinx controller internal web interface. Provide web-control for each Touch Panel in AV system. Include page tracking between Touch Panel and web-control panel. Also include in submittals a detailed one-line diagram of control system network configuration showing all interface boxes, power supplies, Ethernet hubs etc. Provide new and install with rack mount kit in AV Racks and integrate into system as shown in drawings.

- H. Floating Control System Touch Panel (CP-2) – AMX Modero NXT-CV12 (quantity: 1) 12-inch (diagonal) color, rack mounted active matrix TFT monitor. Monitor to have composite NTSC inputs. Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Provide new, install in AV rack, and integrate into system as shown in drawings.
- I. (Intentionally Left Blank)
- J. Teleconference Mixer/Router (TMR-1) – ClearOne/Gentner XPA-800 teleconference mixer (quantity: 1) with echo cancellation for each microphone input, 12 x 12 router and digital signal processing including limiters and equalizers for each input and output. Unit to controllable via RS-232. Provide new, install in AV rack, and integrate into system as shown in drawings.
- K. Teleconference Mixer/Router/Interface (TMR-2) – ClearOne/Gentner XPA-400 teleconference mixer (quantity: 1) with echo cancellation for each microphone input, 12 x 12 router and digital signal processing including limiters and equalizers for each input and output. Unit to have integrated telephone interface. Unit to controllable via RS-232. Provide new, install in AV rack, and integrate into system as shown in drawings.
- L. (Intentionally Left Blank)
- M. Audio Amplifier (AMP-1) – QSC CX-204V four channel 70-volt amplifier (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- N. Video /Audio DA (VDA-2) Extron AVDA 6 MX one composite video with stereo balanced audio input and six composite video with stereo balanced audio outputs distribution amplifier (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings
- O. (Intentionally Left Blank)
- P. (Intentionally Left Blank)
- Q. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
 - Composite Video Plenum Rated Cable: West Penn 25806
 - RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
 - Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350
 - Control CAT5E Plenum Rated Cable: West Penn 254245
 - Loudspeaker plenum cable: West Penn 25226
- R. Control System Ethernet Switch (CSS-1) Cisco Catalyst 2940-8TT fast Ethernet switch (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- S. Video /Audio DA (VDA-7) Extron MDA 3AV one composite video with stereo balanced audio input and three composite video with stereo balanced audio outputs distribution amplifier (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- T. RGBHV DA (VDA-3) Extron DA2 RGBHV one RGBHV BNC input and two RGBHV BNC outputs distribution amplifier (quantity: 1). Provide new, install in AV rack, and integrate into system as shown in drawings.
- U. RF Demodulator (DMD-1) – Blonder Tongue AD-1 demodulator with Option 20 RS-232 serial control (quantity: 2). Provide new, install in AV rack, and integrate into system as shown in drawings.

2.10 FIELD PRODUCTS – CONFERENCE ROOMS 1.2325A, 1.2325B AND 1.2325C

- A. Floor Box (FB-21, FB-22, FB-41, FB-42) – Four FSR FL-640P-B-6 floor pocket assemblies *provided and installed by Electrical Contractor*. Electrical Contractor will also provide and install one electrical power outlet within each of these Floor Pockets. Provide custom insert plates for each Floor Pocket (quantity: 2 plates each in Floor Pocket, 8 total plates) with low-voltage connectors and engraving as shown in drawings. Provide all low-voltage wiring, and install insert plates as shown in drawings.
- B. Floor Box (FB-31 & FB-32) – One FSR FL-640P-B-6 floor pocket assemblies *provided and installed by Electrical Contractor*. Electrical Contractor will also provide and install one electrical power outlet within each of these Floor Pockets. Provide custom insert plates for each Floor Pocket (quantity: 2 plate each in Floor Pocket, 4 total plates) with low-voltage connectors and engraving as shown in drawings. Provide all low-voltage wiring, and install insert plates as shown in drawings
- C. Web Camera (CAM-2) - Axis 2100 1-chip analog CCD video camera with network capabilities (quantity: 3). Install new, at wall with Pelco wall bracket, where shown on drawings.
- D. Ceiling Loudspeakers (S) – JBL Control 26CT ceiling mounted 6.5 inch, two-way, loudspeakers with 70-volt transformer (quantity: as shown on drawings). Loudspeakers to have switchable taps at 60, 30 and 15 watts. Provide new and integrate into system as shown in drawings.
- E. Front Projection Screen (SC-1) (OFOI) Draper Access/Series V 80" x 60" electric tab-tensioned electric projection screen with M1300 matte white surface and extra 5 foot black drop at top with low voltage control (quantity: 3). Provide new, and integrate into system as shown in drawings.
- F. Front Projection Screen (SC-2) (OFOI) Draper Access/Series V 12' x 9' electric tab-tensioned electric projection screen with M1300 matte white surface with one foot extra black drop at top with low voltage control (quantity: 1). Provide new, and integrate into system as shown in drawings.
- G. Ceiling Mounted Video Projector (VDP-2) - Sharp XG-P25XU with AN-W6EZ 1.3 – 1.7:1 zoom lens and bayonet mount part #CLNS-0236CE01 (quantity 2). Video/data projector with 4000 ANSI lumen light output. Provide Extron IPL-T-S2 Ethernet to RS-232 interface (quantity: 2). Use Sharp AN-XGCM61 mount (quantity: 2). Integrate into system as shown in drawings.
- H. Wall Mounted Control System Touch Panel (WCP-1) – AMX AXD-CP4/A 4-inch color passive touch panel with 6 fixed external backlit illuminated pushbuttons (quantity: 3). Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Locate at wall plate WP-C. Provide new and integrate into system as shown in drawings.
- I. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.
 - Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.
 - Composite Video Plenum Rated Cable: West Penn 25806
 - RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.
 - Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350
 - Control CAT5E Plenum Rated Cable: West Penn 254245
 - Loudspeaker plenum cable: West Penn 25226
- J. AMX Control Power Breakout Cable- Provide six foot power breakout cable with 4-pin XLR to mini phoenix connector (quantity: 2). Provide new.

2.11 FIELD PRODUCTS – MULTI-MEDIA LECTERN CONFERENCE ROOMS 1.2325A, 1.2325B & 1.2325C

- A. Multi-Media Lectern (ML-2) - Van San Custom #3 Multimedia lectern with clock, light, equipment rack and locking document camera drawer. (quantity: 2). Wood to be walnut or oak veneer. Finish to wood, stained according to Owner. Mount equipment identified below into lectern. Reference Van San Quote # 3302.
- B. Multi-Media Lectern Gooseneck Microphone (LGM-1) – AKG GN50 20-inch gooseneck and AKG CK31 cardioid capsule (quantity: 4). Provide 15-foot ProCo AmeriQuad quad standard microphone cable (quantity: 4). Provide new, and integrate into system as shown in drawings.
- C. Multi-Media Lectern Control Touch Panel (CTLP-3) – AMX NTD-CV7 Modero 7-inch color video touch control panel (quantity: 2). Owner and AV Contractor to coordinate all touch panel layouts. Program each panel to provide simple, intuitive control of all video / RGBHV source and destination routing assignments, audiovisual system power (including projector power), and VCR transport functions. Include screen design and menu branching drawings in submittals. Provide new, and integrate into system as shown in drawings.
- D. Multi-Media Lectern Cable Cubby (LCC-1) – Extron 300 series cable cubby (quantity: 2). with Extron interconnect cables as indicated in drawings. Provide new, and integrate into system as shown in drawings.
- E. Multi-Media Lectern Video Switcher (VSW-10) Extron MAV44 (quantity: 2) four input, four output composite video with balanced stereo audio matrix switcher. Provide new, and integrate into system as shown in drawings.
- F. Multi-Media Lectern VGA Switcher (VSW-11) – Extron SW4 VGA Ars (quantity: 2) four input, one output VGA with balanced stereo audio switcher. Provide new, and integrate into system as shown in drawings.
- G. Multi-Media Lectern S-VHS VCR (VCR-1) – JVC SR-V10U S-VHS VCR (quantity: 2). Provide new with rack mount kit. Install in Lectern and integrate into system as shown in drawings.
- H. Multi-Media Lectern EtherNet Switch – Cisco Catalyst 2940-8TT fast Ethernet switch (quantity: 2).. Provide new, and integrate into system as shown in drawings.
- I. Multi-Media Lectern Integrated Control System (LIC-1) – AMX NI-2000 integrated control system. (quantity: 2). AMX to provide all software programming. Refer to AMX Master Quote #M40031. Owner to provide a copy of standard Touch Panel pages for reference. AV Contractor to provide all source code. AV Contractor to provide web-control using AMX NetLinx controller internal web interface. Provide web-control for each Touch Panel in AV system. Include page tracking between Touch Panel and web-control panel. Also include in submittals a detailed one-line diagram of control system network configuration showing all interface boxes, power supplies, Ethernet hubs etc. Provide new and install with rack mount kit in Lectern racks and integrate into system as shown in drawings.
- J. Multi-Media Lectern Rack Drawer (DRAW-L1) – Middle Atlantic TD2-FLK two rack unit lockable drawer (quantity: 2). Provide new, install in lectern rack and integrate into system as shown in drawings.
- K. Connectors – Connectors to be of the quantity and type as required for proper and durable operation and signal transmission of the electrical characteristics for associated circuitry. Microphone connectors: 3-conductor XLR type. Control panels: XLR type with number of conductors as required. Line level and left/right audio connectors: tip/ring/sleeve 1/4" phone jacks with insulated bushings. Composite video and RGBS connectors: BNC dual crimp 75 ohm Canare or accepted substitution. S-video: standard 4-pin S-video mini-din.

L. Interconnect Wiring – Provide and install following cable as required for connections in all areas. Meet provisions of N.E.C.

 Audio Plenum Rated Cable: West Penn 25452, West Penn 25291, or similar.

 Composite Video Plenum Rated Cable: West Penn 25806

 RGBHV Plenum Rated Cable: West Penn 258195 or Belden 1826A or Liberty RGB5C-SD-PLN.

 Control Plenum Rated Cable: Control Plenum Rated Cable: West Penn D25350

 Control CAT5E Plenum Rated Cable: West Penn 254245.

 Loudspeaker plenum cable: West Penn 25226

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Guidelines

1. Quality of Work - Perform labor to accepted industry standards and state and local codes to accomplish complete and working system.
2. Material and Labor - Provide specified products and other incidental materials, appliances, tools, and transportation required for complete and functioning systems. Provide personnel to perform labor who are skilled in techniques and technical knowledge of sound and audio-visual system installations.
3. Documents at Job Site - Keep following documents at job site during entire construction period.
 - a. Complete Specifications and Drawings
 - b. Approved Shop Drawings
 - c. Approved Product Data
 - d. Progress Set of Project Record Documents
4. Mounting - Mount equipment and enclosures plumb and square. Ensure that permanently installed equipment is firmly and safely held in place. Design equipment supports to support loads imposed with project safety factor of 5 or greater. For devices hung overhead, obtain review by Structural Engineer licensed to practice in State of Texas.
5. Minor Equipment Moves - The process of equalizing and testing sound systems may necessitate moving and adjusting certain component parts such as loudspeakers. Perform requested minor moves during Final Tests and Adjustments without claim for additional payment.
6. Dimension Verification - Verify dimensions and space requirements to assure that proper mounting, clearance, and maintenance access space is available for system components.
7. Grommets - Cover edges of cable pass-through holes in chassis, rack, boxes, etc. with rubber grommets or Brad GRNY nylon grommets.
8. Future Maintenance Access – Install equipment rack and mixing consoles allowing access to rear connections by maintenance personnel without removal or disconnection of equipment. Install field devices and field wiring such that maintenance personnel can access terminations and splices without special equipment or disconnection of installed equipment.
9. Coordination - Coordinate work with other trades to avoid delays in construction schedule. Meet construction schedule.
10. Clean-Up - Leave project clean each day. Place debris where designated by General Contractor. Debris includes but not limited to: solder splatter, cable ends, stripped insulation, spent crimp connectors, gypsum board and ceiling tile dust, and product wrappings and cartons. After completion of installation, thoroughly clean areas worked, including non-visible areas such as equipment rack interiors, rack top panels, and inside lockable floor and wall boxes.

B. Labeling

1. Equipment Labels - Audio Visual Contractor to provide engraved lamicoid labels on front and rear of rack-mounted equipment. Mount labels plumb and square. Include schematic reference design, item name, and system or area controlled by labeled component. On program preamps and mixers, provide label for each input indicating which source is controlled by labeled channel. Unless otherwise indicated, provide permanently-mounted black labels engraved with 1/8-inch

white block characters. Handwritten, self-laminating, or embossed plastic (Dymo) labels are not acceptable. Provide labels for major equipment with 3 lines (minimum) of engraving, coded as follows.

- a. Line 1: Generic name of device, such as VIDEO MATRIX SWITCHER.
- b. Line 2: Schematic designation of device, such as AV-MSW-1.
2. Control Labels - Audio Visual Contractor to provide engraved label over each user-operated control that describes the function or purpose of control. Provide label of proper size to fit available space.
3. Terminal Strip Labels - Audio Visual Contractor to label each terminal strip with unique identification code in addition to numerical label (Cinch MS series) for each terminal. Show terminal strip codes on system schematic drawings included with Project Record Documents.
4. Rear Equipment Labels - Audio Visual Contractor to provide adhesive label on rear of equipment where cables attach, to indicate designation of cable connected at each point.
5. Cable and Wire Labels - Label cables and wiring logically, legibly and permanently for easy identification. Labels on cables to be adhesive strip type, covered with clear heat shrink tubing. Factory stamped heat shrink tubing may be used. Hand-written or self-laminating type labels are not acceptable.
6. Cable Label Codes and Locations - Audio Visual Contractor to label each cable with unique alphanumeric code. Locate cable designation at start and end of each cable run, within 3 inches of termination point. For cable runs that have intermediate splice points, label cable with same designation throughout, with additional suffix to indicate each segment of run. Provide cable designation codes to schematic drawings included with Project Record Documents and Operation and Maintenance Manuals.

C. Power and Grounding

1. Power Coordination - Audio Visual Contractor to coordinate final connection of power and ground wiring to rack. Electrical contractor will provide power to sound and audio-visual systems. Before installation, verify load requirements for systems as accepted.
2. Bus Bars - Install 1-inch by ¼-inch copper ground bus bar, top to bottom in each rack. Ground equipment chassis of each rack-mounted component without three-pin grounding plug to bus bars with #12 AWG insulated green wire using 6-32 or larger nuts, bolts, lockwashers, and appropriate connectors. Electrical Contractor to provide and connect #4 AWG green insulated wire to ground point in electrical panel.

D. Equipment Racks

1. Assembly - Mount, wire, and fully test equipment in racks.
2. Ventilation - Provide ventilation adequate to keep temperature in rack below 100 degrees Fahrenheit. Use "whisper" type ventilation fans in racks, adjusted to come on when temperature in rack rises above 100 degrees Fahrenheit, only if adequate cooling cannot be provided by Owner.
3. Rack Wiring - Wire equipment racks neatly, allowing proper slack for future serviceability. Looking from rear of equipment rack AR-4, locate power, digital control, DC control, and loudspeaker cables on right; and, locate microphone, line level audio on left. Maintain separate cable bundles for different types of signals. Do not bundle power cords permanently attached to equipment with other power cords. Do not block access to front-mounted equipment with equipment mounted to rear rack rails.

E. Wiring

1. Wiring Standards - Execute wiring in strict adherence to standard audiovisual engineering practices.
2. Field Connection Devices - Connect cable to active components through screw terminal connections and spade lugs when appropriate. For BNC connections use three piece, dual crimp BNC properly sized for cable with insulating bushings. Wire nut or "Skotchlock" connectors are not acceptable. Do not wrap audio cable splices or connections with adhesive backed tape. Punch connectors or telephone-style punch blocks are not acceptable anywhere in the installation unless specifically authorized by Consultant

3. Cable in ceiling plenums to be run neatly parallel to building walls, supported every three feet to structure.
4. Raceways - Run vertical wiring inside rack in Panduit (or equivalent) plastic raceways with snap-on covers, sized to allow at least 50% future wiring. Mount raceways on full length $\frac{3}{4}$ -inch flat black plywood backboards, attached to rack sides. If between-rack wiring chases are provided, Panduit raceways are not required. Horizontal wiring in rack to be neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack, but still allow for service and testing. Provide horizontal support bars if cable bundles sag. Individually bundle excess AC power cable away from rack mounted equipment with plastic cable ties. Electrical tape and adhesive backed cable tie anchors are not acceptable.
5. Terminal Blocks - Connect wiring entering equipment racks via terminal blocks (Cinch 140 or 142 series). Leave terminal blocks fully exposed and labeled, mounted on $\frac{3}{4}$ -inch plywood painted flat black.
6. Accessibility - Ensure that wiring and connections are completely visible and labeled in rack. Mount termination resistors, if required, on terminal strips, fully visible and not concealed within equipment or connectors.
7. Loudspeaker Polarity - Connect loudspeakers electrically in phase, using same wire color for loudspeaker wiring throughout project.
8. Physical Damage Prevention - Take necessary precautions to prevent physical damage to cables and equipment. Damaged cables or equipment will not be accepted. Separate, organize, and route cables to restrict channel crosstalk and feedback oscillation.
9. Hum Prevention - Ensure that electromagnetic and electrostatic hum is at inaudible levels. For line level signals, float cable shields at the output of the source device. Do not cut or remove shield conductors; fold back unconnected shields over cable jacket and cover with clear heat-shrink tubing. Do not obstruct cable labels.
10. Other Connections - Make connections using rosin core solder or approved mechanical connectors. Where spade lugs are used, crimp properly with ratchet type crimping tool. Solder spade lugs mounted on #22 AWG or smaller cable after crimping.

3.2 INITIAL TESTS AND ADJUSTMENTS

- A. Purpose - These tests are to ensure that system is ready for Final Tests and Adjustments (described later).
- B. Inspection - Verify prior to beginning actual tests and adjustments on systems.
 1. Proper grounding of all electronic components (through third prong of power connector or separate connection between component chassis and ground bus bar).
 2. Cables dressed, routed, and labeled, connected with proper polarity.
 3. Insulation and shrink tubing in place
 4. Dust, debris, solder splatter, etc. removed
 5. Proper frequency settings (or modules) at crossovers and controllers.
 6. All equalizer bands and tone controls set for flat frequency response.
 7. Test Instruments - Perform measurements using professional quality test equipment. Acoustical measurement equipment shall be ANSI Standard Type 1 or IEC Precision Sound Level Meter set for "slow" meter damping and flat response (unless otherwise indicated). Light measuring equipment shall meet ANSI standards for measuring foot-candles.
- C. Test Instruments - Perform measurements using professional quality test equipment. Acoustical measurement equipment shall be ANSI Standard Type 1 or IEC Precision Sound Level Meter set for "slow" meter damping and flat response (unless otherwise indicated). Light measuring equipment shall meet ANSI standards for measuring foot-candles.
- D. System Grounding Tests – While all sound/AV system power panel circuit breakers are turned off, coordinate with Electrical Contractor to temporarily lift incoming main ground conductor from ground bus in sound/AV system power panel. Measure and record DC resistance between the power panel ground

bus (now floating) and the disconnected feed from main ground. Resistance should be greater than 1000 ohms. If less than 1000 ohms, determine the electrical paths between system ground and power panel ground causing such readings, and report findings.

- E. Color Bar Adjustments – Adjust color of all projectors, monitors, and plasma displays for consistent color representation using color bar displays generated from projector and/or display internal generators or contractor-provided portable generator. Adjust under ambient lighting conditions anticipated for user of room.
- F. Electrical Power Quality - While all sound and audio-visual system components are unplugged from electrical power outlets, AV Contractor to turn on power to outlets, and confirm proper voltages at each outlet across the following pairs of terminals: hot and neutral, hot and ground, and neutral and ground (zero volts across neutral and ground). AV Contractor to document measurements.
- G. General Function Tests - Test each piece of equipment to ensure that it performs its intended function. Include all portable equipment in tests. Intent of initial tests is to verify complete, functioning system before Final Tests and Adjustments. Correct problems found during initial testing before beginning Final Tests and Adjustments. Document whether all pieces performed intended functions; note any unresolved malfunctions.
- H. Initial Tests and Adjustments Data - Submit written report of Initial Tests and Adjustments data upon completion of initial tests. Include printed name(s) of technician(s) performing tests, date(s) and time(s) of tests, model and serial numbers of test equipment, results of each initial test, descriptions of problems encountered and their solutions, and statement that system is ready for Final Tests and Adjustments. Initial Tests and Adjustments Data to include signatures of technician(s) performing tests.
- I. Timetable
 - 1. Submit report of Initial Tests and Adjustments data within 2 days of completion of initial tests.
 - 2. Allow minimum of 3 days for review. If resubmittal is required, Owner shall be reimbursed by Contractor for expenses incurred..
- J. Provide EIA RS250C Short-haul video & audio link performance test results.

3.3 FINAL TESTS AND ADJUSTMENTS

- A. Purpose – These tests are to be witnessed by Acoustical Consultant to determine if system is complete and functioning as designed. Also, Acoustical Consultant will perform listening and viewing tests and witness adjustments of all images for optimum clarity.
- B. Timetable - Coordinate with Owner, General Contractor, and Acoustical Consultant to schedule Final Tests and Adjustments after submittal of Initial Tests and Adjustments data.
- C. System and Site Conditions – Acoustical Consultant (as Owner's representative) will witness Final Tests and Adjustments. Have systems fully functional and ready for inspection and testing upon Consultant's arrival. Coordinate with all trades for quiet conditions throughout the listening areas and for the duration of the test schedule. If upon Consultant's arrival, systems do not meet criteria, site is not sufficiently quiet, or if Owner or Acoustical Consultant is required to make additional trips to job site to witness additional testing or perform additional reviews of installed equipment, Contractor shall reimburse Owner for labor and expenses incurred by having incurred costs deducted from payments to contractor.
- D. Test Labor - Provide technician familiar with sound and audio-visual systems and operation of test equipment to perform testing. Provide additional technician to assist in the tests and to perform troubleshooting, repairs, and adjustments. Include labor for these technicians to be present for two(2) ten(10)-hour days during Final Tests and Adjustments.

- E. Test Equipment - Provide professional quality test equipment on site for final acceptance testing. Test equipment to be available for entire period through final system acceptance. Submit letter listing test equipment make and model numbers 10 days prior to scheduled Final Tests and Adjustments. (Note: Acoustical Consultant will provide TEF machine for observing results of adjustments to delays, filters, and gains.)
- F. Laptop Computer – Provide with necessary cable and software for configuring AMX hardware.
- G. Program Source Material – Wide range of videotape programs recorded using VHS and S-VHS. Also provide one blank (or erasable) medium for each recording format in the system.
- H. Tools - Provide standard hand tools including screwdrivers, pliers, wire strippers, nut drivers, soldering iron, and other tools appropriate for troubleshooting system problems during testing.
- I. Ladders and Scaffolds - Provide ladders and scaffolds to inspect/adjust loudspeakers and rigging points.
- J. Communication - Provide 3 portable UHF band two-way radios for use during final testing. Transmission range: sufficient to cover the entire project. Include rechargeable batteries/recharger and holster for wearing on belt. Make radios available for duration of testing process, including follow-up visits. Confirm that radio frequencies used are acceptable and do not conflict with operation of other RF devices in vicinity.
- K. Verification of Initial Tests and Adjustments - Verify that Initial Tests and Adjustments have been performed and meet criteria. During Final Tests and Adjustments, Acoustical Consultant may require portions of the Initial Tests and Adjustments to be repeated. Repeat measurements as requested without claim for additional payment.
- L. Procedures
 - 1. Control Functions - Check control functions for proper operation, from controlling devices to controlled devices.
 - 2. Perform ANSI projected light measurement test for video/data projectors. Refer to ANSI PH3.705-80(R85) or ANSI PH7.201-83.
 - 3. Adjustments - Adjust, balance, and align equipment for optimum quality, meeting manufacturer's published specifications and as requested by owner and audio-visual consultant.
 - 4. Inventory – Inventory all installed and portable equipment for correct quantities.
 - 5. Other Tests - Perform any other tests on any piece of equipment or audio-visual system as requested by Consultant.

3.4 FINAL ACCEPTANCE BY OWNER

- A. Certificate – Submit Certificate of Final Acceptance form signed by Owner verifying complete installation and proper operation of systems upon fulfillment of all requirements and upon recommendation by Consultant.
- B. General Adjustments – Adjust, balance, and align equipment for optimum quality, meeting manufacturers published specifications.
- C. Input Jack Demonstration – Demonstrate proper performance and phase of each system input jack (all video, computer and audio input jacks) as received at audio-visual, sound and broadcast systems.
- D. Inventory – Inventory all installed and portable equipment for correct quantities.
- E. Functional Demonstration – Demonstrate operation of each function of each major piece of equipment.

- F. Other Tests - Perform any other tests on any piece of equipment or audio system as requested by Consultant.
- G. Final Equipment Settings – Record final settings of all equalizer bands, tone controls, filters, delays, limiters, etc., including those established through computer software settings. Include descriptions of settings (including software settings) in Operation and Maintenance Manual. Include software copy of configuration file(s) in Operation and Maintenance Manual.
- H. Security Inspection – Inspect equipment for security from tampering (covers, shaft-locks, etc.).
- I. Review of Labels – Review installed labels on cables, equipment, controls, and terminal strips.
- J. Review of Heat Dissipation – Survey temperatures of each piece of equipment after 4 hours use (minimum). Note any hot equipment.

3.5 SUPPORT DURING OWNER'S FIRST USE OF COMPLETED SYSTEM

- A. Provide personnel familiar with design, installation, and operation of the system to be present at Owner's first use of the completed system (up to 8 hours in a single session). During first use, respond to Owner requests for troubleshooting, adjustments, and additional training. If no one contractor employee or representative can provide expertise in all aspects of the system, provide multiple personnel for the 4 hours as required. Schedule presence of personnel in advance with Owner. Should significant elements of the new system be operational prior to final completion, Owner may elect to schedule contractor presence for church function prior to final completion of system. Should Owner exercise this option, contractor presence will not be required at first use following final completion.

END OF SECTION 11738